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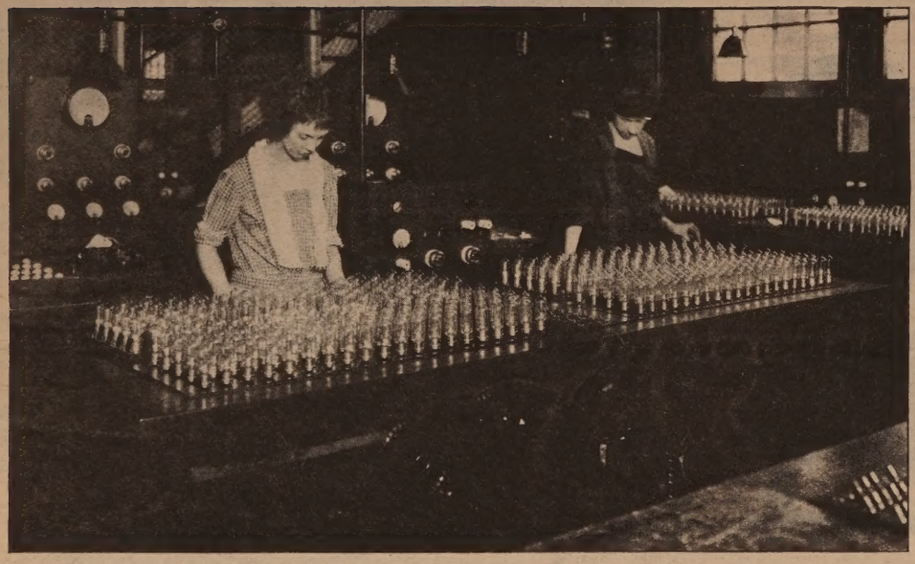
THE HORN SPEAKER

THE NEWPAPER FOR THE HOBBYIST OF VINTAGE ELECTRONICS AND SOUND



WD-11's and WD-12's on the aging table. The tubes are kept on this table one hour to increase the possible electron emission and to test for the degree of vacuum

How Vacuum Tubes are Made

Following the WD-11's and WD-12's Through One of the Plants in Which They are Made

By W. W. RODGERS

Westinghouse Electric and Manufacturing Company

This is the first time that an article has been published in a radio magazine describing and illustrating the important steps in the manufacture of vacuum tubes. Except for minor modifications and a difference in the exhausting process, all vacuum tubes are made in a way much like the dry-cell tubes here described by Mr. Rodgers.—THE EDITOR.

IF ONE were asked what single factor has made radio universally popular in America, the answer might not be as difficult as it first seems. For, of the many things introduced into the radio market for the benefit of amateur and fan, the dry-cell vacuum tube stands supreme in the number of radio enthusiasts it has added to the list of those who nightly listen-in. Thousands of new fans were created as soon as the dry-cell tube began to be sold in quantities.

This little tube eliminated a sharp class distinction in the radio world. Before it came there were the crystal detector users and the vacuum-tube users. Crystal detector sets were numerically superior to vacuum-tube sets when all that could be obtained was the six-volt tube operated from a heavy and expensive storage battery. People who could not afford these items had to be content with crystal detectors, and thus were very limited in their range of radio entertainment.

Then came the dry-cell tube, changing this condition. The purchaser of the one-volt tube could procure his current from a 40-cent dry cell; whereas the storage battery needed for a six-volt tube cost from ten to twenty dollars. There was such a rush on the part of the public to buy, that for a time the manufacturers were swamped. In fact, two great shortages have occurred in the vacuum tube supply since they were first placed on sale.

FIG. 1

The short glass tube has a flare on one end and its other end has been melted and pressed down around the five wires, which are imbedded firmly in the glass. Note that there are five wires in the glass press, but only four leads come through the flared opening. The fifth wire is a blind which acts as a support, later, for the plate

These shortages are not likely to occur again as they occurred with a type of tube made by one company, which at the time was the only concern in America capable of producing these tubes in quantities. There are now two companies making such vacuum tubes, and thus with their increased facilities a much larger production is available.

The first commercial dry-cell vacuum tube, the WD-11, is a product of the Research Laboratories of the Westinghouse Electric and Manufacturing Company at East Pittsburgh, Pa. It was here that the need for such a tube was first seen and the research work necessary to the perfection of the finished tube carried on.

Early in radio telephone broadcasting history, after the public had indicated its interest in the concerts and the possibilities of the industry were realized, the need for a vacuum tube which could be operated at low cost was clearly seen. It was apparent to the men who had the problem to solve that the first cost of the tube was not what prevented an almost universal interest in radio, but that it was due to the upkeep, as they say in the automobile world. Storage batteries cost money to buy and to keep charged.

Long before the first order was given the Research Laboratory to start experimenting on the proper material for a low-voltage filament, preliminary work had been started by the research engineers. It had been discovered that a new filament was necessary. This filament must consume a very small amount of current yet have a satisfactory electron emission.

However, in spite of the preliminary experimenting on the tube, it was nearly eight months before the Research Laboratory, which received its order from the Company officials to start developing a tube having the WD-11 characteristics in March, 1921, was able to furnish the perfected tube. The first commercially

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practical tube was completed October, 1921. During the eight months intervening a new oxide-coated filament was perfected and the WD-11 type designed.

At first there was some trouble in securing the proper type of worker—one who required no small degree of skill in the various stages of assembly. Girls had been decided upon for a large number of the manufacturing operations, and a few thought that it would require a long period of training to fit them for the work.

While the organization was being perfected the Research Laboratory undertook the construction of 400 tubes. This order came in October, 1921. With an augmented force the 400 tubes were completed in a short time. Then another order for 400 tubes was placed with the Research Laboratory and upon its completion, another and still other orders. The tube became popular at once and the demand for it by the public exceeded expectations.

At the time the tubes were being assembled in the Research Laboratory, a section of the factory in East Pittsburgh was being equipped to build the tubes. The men and girls trained by the research engineers formed the nucleus of the larger force required in the department of the Main Works where the tubes are now assembled. Soon this department was building tubes in daily increasing quantities.

Since the vacuum tube department was given the task, production has so increased that now the average number of tubes assembled daily is 7,500. This is quite a large quantity when one considers the care necessary in their assembly and the number of tests each tube is required to pass before it is considered ready for the purchaser.

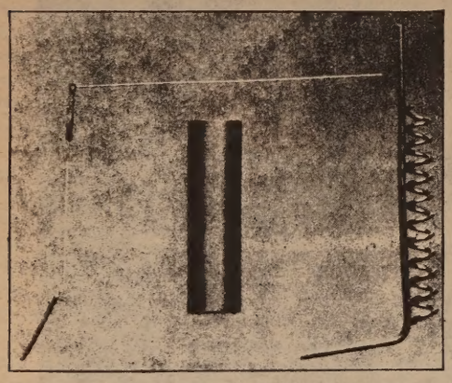


FIG. 2

The filament, plate, and grid of the WD-11 and WD-12 dry-cell tube. Note that the ends of the filament are held by two clips and that there is a support running from the upper clip. These attachments are provided so that the filament may be spot-welded to its support

The WD-11 and WD-12 tubes, which are identical except for their bases, despite the fragile character of the materials used and the great care and skill necessary to their proper assembly, are sturdy bits of apparatus, well adapted to withstand fair handling and give efficient service during a long life. Much attention has been given to constructing them so that they might be small yet not at all delicate. This does not mean that they are dropped on the ground to test the strength of the glass, nor that they will come up smiling after having 22½ volts connected across their filaments. How many users have burned out their dry-cell tubes because of this error! The filament voltage should not be more than one and one-tenth volts.

There are two main units in these tubes—the outer tube, from which the air is removed, and the assembled inner unit. If this is kept in mind and if it is understood that all assembly is done on the inner unit which is then inserted in the outer tube, sealed in and the outer tube exhausted of air, the various stages of manufacture may be followed very easily.

There are 13 steps or processes through which the parts go before they emerge as the complete vacuum tube. There is a test made after each stage of the assembly and still further tests after the tube is completed. The tests are so severe that a tube after it passes through them is rarely returned from a customer for failure to operate correctly.

The raw materials from which the completed tube is made consists of the glass blank, which is purchased from the glass manufacturer already shaped—this forms the glass walls of the tube; a thin glass stem; a short tube of glass, which is later shaped and which holds the wires in place in the tube; the filament, cut to size and coated at the East Pittsburgh plant; the plate; and the grid. The plates are shaped from a rectangular piece of metal, and the grid wires are wound into the spiral form they take in the completed tube.

FIG. 3

Mounting the filament—step seven in the assembly. The operator is holding the assembled inner unit in her hand while she spot-welds the top of the filament to its support

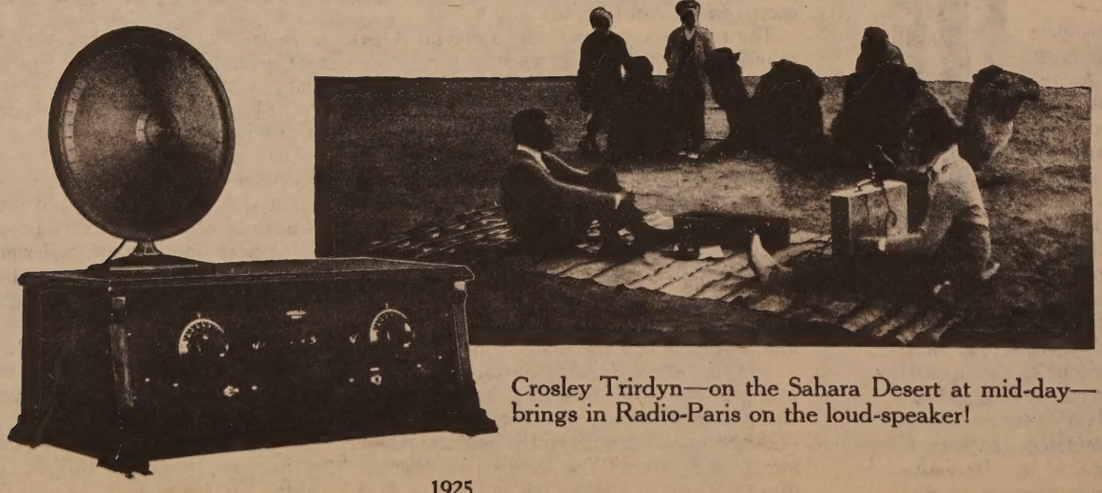
All these units can be seen in the photographs of the assembly process.

The first step in the process is the making of the flare. This consists in heating the small tube on one end to soften it and then spinning on the flare.

It will be noted, if one looks closely (Fig. 1) that there are five wires in the press or inner unit of which four run through. The fifth wire is merely a blind inserted to act as a support for the plate. These wires are white at the top but red where they adhere to the glass in making the seal tight. Dumet wire is used for the seal, nickel being welded to it at the top. A copper covering is necessary so that when the press is melted to hold the wires at its top, a gas-tight joint is formed.

The placing of the five wires in the press is the second operation of the assembly. What this resembles with the five wires imbedded in is clearly shown in the photograph.

Next the stems are cut to the proper length so that when the plate, grid, and filament



Crosley Trirdyn—on the Sahara Desert at mid-day—brings in Radio-Paris on the loud-speaker!

FIG. 4
The assembled inner unit complete, with grid, plate, and filament mounted. The flare at the end of the glass mount is used for sealing in this assembled inner unit to the glass blank

(Fig. 2) are inserted they will fit in their proper places. This makes the fourth step in the operation.

Step five consists of mounting the plate. This is spot-welded to its support by a girl who has a special machine for the task.

Step six consists in mounting the grid. This is also spot-welded at the top and bottom to its mounting.

The next step is mounting the filament (Fig. 3). This filament, which is a platinum iridium alloy, coated with an oxide of barium and strontsium, comes to the girls already cut to the right length, properly tested and with its ends ready for mounting. Mounting the filament is probably the most delicate task in the assembly of the tube.

There is a good reason for using an alloy for the vacuum-tube filament. Ordinary metals are not used because they are not as strong at the temperature to which they are subjected as is the alloy. Making the tube strong enough to stand the wear and tear of daily use was ever a problem before the research department. All sorts of metals were tried. The WD-11 filament has a long life which accounts for the fact that it will give service for a period often ranging between 2,000 and 3,000 hours.

Step seven is completed with the mounting of the filament (Fig. 4). The weld press is completed and is ready to be placed in the glass blank (Fig. 5), which first must be prepared for exhausting.

Step eight in the process is called tubulating the glass blank (Fig. 7). A thin point of flame is blown against the rounded end of the glass blank, so that a tiny hole is melted through. Then the glass tube is welded around this hole. The blank now has a glass tube running

FIG. 5
The glass blank as it is received from the glass factory

from its end (Fig. 6). This glass tube is attached for the purpose of exhausting the tube. As the other end of the tube is sealed this end remains so that it can be attached to the pumping machines.

The next step, number nine, is termed sealing-in (Fig. 8). When it is finished, the glass weld with its mounted plate, grid and filament and the four wires, running out of its end, is firmly sealed to the glass blank. The flare, first spun on the press, is used to make this joint.

At this point, the tube resembles a completed vacuum tube except that it has no base and has a long glass tube mounted on its top.

When the sealing is completed, the tube is tested for leaks in any part of it. It is also tested for short circuits from filament to grid and from grid to plate.

Step ten—exhausting the air from the tube—is a very important one (Fig. 9). Before arriving at this stage, a getter has been painted on the base of the glass weld. It can be seen as the white dab on the press holding the five wires in place. From 10 to 15 minutes are required to exhaust each tube.

In exhausting the tube, the glass stem at the top is inserted in a piece of rubber tubing which leads directly to the pumps. These are two in number, an oil pump and a mercury-vapor pump.

A covering is pulled down over the tubes. This covering serves as an oven to bake them at a temperature of 400° Centigrade and thus reduce the gas content.

Then the pumps are turned on and the tubes exhausted to a pressure of one-millionth of a millimeter of mercury. This is a much higher point of exhaustion than that given the electric lamp.

As the tube sits in the holder, it is surrounded by a coil of heavy copper wire. The covering is now pulled up and a high-frequency spark is thrown on this surrounding coil to test the tube for cracked glass.

After this, the plate is heated red hot by an oscillating current having a frequency of 1,000,000 cycles—these are generated by two 250-watt tubes similar to those used for transmitting purposes—to remove the gas from the plates and metal supports.

Next in order is the turning off of the plate oscillations and heating the filament to obtain the proper chemical reaction on the filament oxide and thus increase the possible electron emission.

The tip is now sealed off by the machine operator using a gas flame, which he runs around the bottom of the glass tube until it melts off and forms the tip.

Finally the tube, properly exhausted is removed from the machine, complete now except for the base (Fig. 10).

FIG. 6
The glass blank with its stem attached

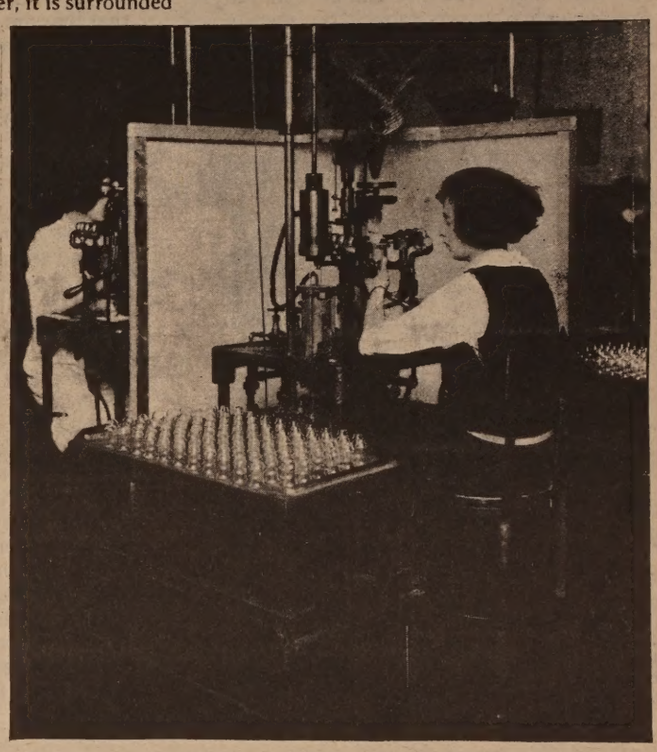


FIG. 7
Tubulating the blank. A tiny hole is melted in the rounded end of the glass blank and around this hole is sealed a glass stem

The tube now passes through several stages of inspection before the bases are cemented on. During this inspection, the tube is carefully looked over for appearance and poor tips, and for degree of vacuum. Opposite the inspectors who take the tube at this stage there is a box into which the rejected tubes are tossed and smashed to fine bits.

Step number eleven is cementing the base to the tube. Just before "basing," a small glass stem is slipped over each of the four leads to prevent any shorts at this point. The base is filled with a cement, an operator draws the four wires through the stems in the bottom of it, and the tube with its base attached is placed in a machine which bakes the base on firmly. Included in the basing operation is the soldering of the bottom of the tips on the base and rounding off the ends of the stems. An operator dips the stems in a solder pot so that the wires running through the stems are soldered firmly in place. To make a neat job, the stems are next placed in a machine so that they are rounded off properly. Just look at the tips on the base of your vacuum tube to understand this operation.

Thus when the tube reaches this stage it resembles the one used in the receiving set. But it still has some tests and processes to go through before it can be called completed.

The next step is a test, and while it is given no number in the order of assembly, it is important. This test is termed lighting out the tube (Fig. 11). An operator places the tube in a base connected to three electric lamps; one red, one blue, and one white. The red lamp is in series with the grid, the blue lamp is in series with the plate and the white lamp is in series with the filament. If, when the tube is placed in this base, one of the lamps glows, it is discarded, for it plainly can be seen that the wires are short-circuited and the tube is unfit for use.

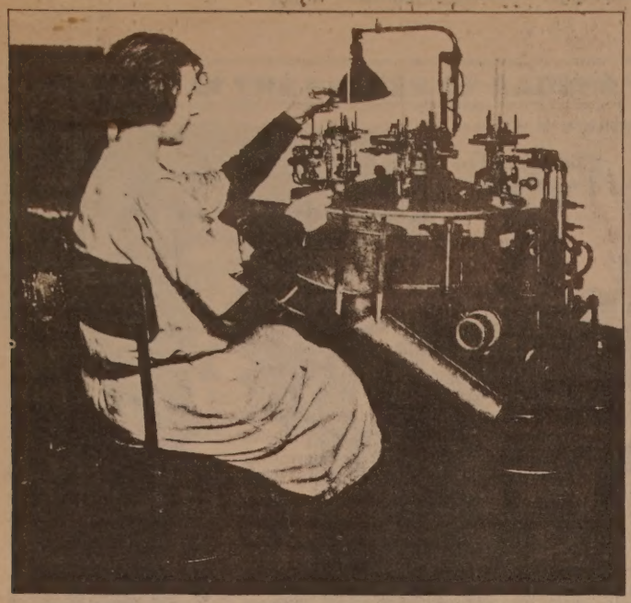


FIG. 8

In this process, the assembled inner unit is sealed by means of its flare to the bottom of the glass blank

tive grid current. During the aging process, the getter absorbs such gases as might remain in the tube.

After leaving the aging table, the tubes are stored for three days. This is time enough to determine whether there are any air leaks. After this final storage, they are again tested for all circuits, filament emission, degree of vacuum and appearance and are ready for shipping.

The final stage is the packing. Those who have purchased the WD-11 know how carefully it is packed in its cardboard box with many layers of packing material wrapped around it.

The process of assembling these tubes is one that is long and tedious, calling for the utmost skill on the part of the various operators. In assembling the plate, grid and filament, girls do the task. They do, also, most of the preliminary tests. Men operate the exhausting machines and do the final testing.

A visit to the vacuum-tube department at East Pittsburgh is a revelation of the efficiency of the workers. The recruits are trained by skilled operators a number of weeks before they are placed at the task of doing the actual assembling. Some difficulty is experienced in obtaining girls who are dexterous enough to do the work properly. The employment department thinks that if one girl out of ten or fifteen sent to it is found satisfactory, it is doing well. All these things must be considered in the assembling process. The skill of the worker is largely responsible for the efficiency of the tube.

Dry-cell tubes have been brought to a high point of efficiency, and experiments are constantly being carried on to develop this efficiency further. The point now has been reached where it costs much less to operate the filament of a vacuum tube than it does to light the electric lamp above the head of the radio enthusiast operating his receiver.

Those of the tubes which pass this test go on to the next stage. This is a test and a process combined for developing more efficiency in the tube. It is step twelve, otherwise known as the aging process. In it the tubes are placed upright, several hundred at a time, on a table, with their leads connected to circuits which are slightly stronger in voltage than the tube is subjected to in normal use (photo p. 397). The tubes are kept on this table one hour to see if any faults develop and to obtain the maximum electron emission from the filament. During this aging test, sometimes the degree of vacuum is found to be insufficient. This condition can be determined by a measurement of the nega-

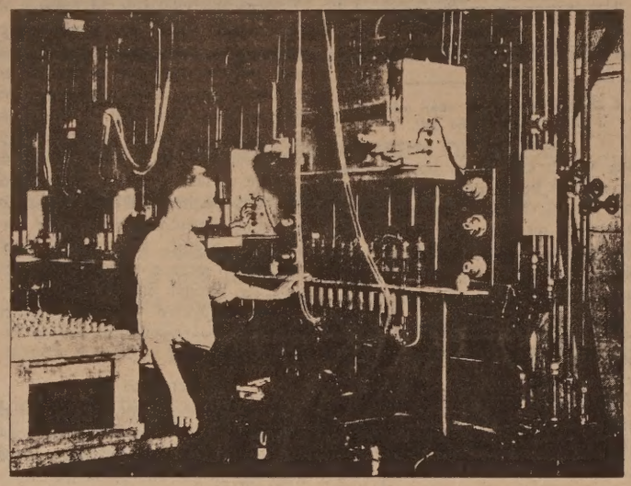


FIG. 9

Exhausting the tube—step ten. Ten tubes are exhausted simultaneously in this machine. Each one is surrounded by a coil, described in the article, and its glass stem is attached to a rubber tube (seen underneath the shelf) which leads to the pumps. The white box-like affair just above the row of tubes is the oven. It is pulled down over the tubes to bake them as a part of the exhausting process

Each tube is a monument to masterful research, inventive genius, the wizardry of modern machinery and a perfect organization of workers and officials.

It is certain that further experiments now going on will reduce this operating cost and still further lengthen the life of the dry cell. The Research Laboratory which first developed the tube is constantly working on various forms of low-voltage tubes. These stories, however, must wait until the tubes are perfected.

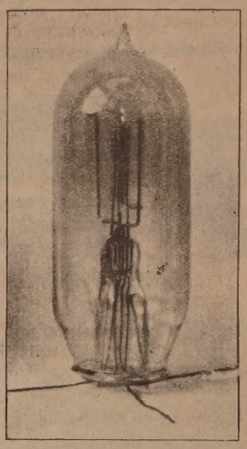


FIG. 10

After the tube has been exhausted and the glass stem sealed off, it resembles the completed tube except that it has no base

FIG. 11

"Lighting out." The tube is placed in a holder leading to the three lights in series with the grid, plate, and filament. If one of the lamps lights when a tube is placed in the holder, the operator knows that the tube has developed a short circuit

NATURAL CONDENSERS—STORM CLOUDS

Auto-Radio . . .

"B" POWER FOR AUTO-RADIO SETS

By G. McL. Cole*

SPRING is here! No question about it—the red flannel undies have been itching for some days now. Spring is here and Summer . . . auto-radio time . . . is not far behind.

Auto-radio time, this year, represents a tremendously potential field of revenue for the alert Service Man. Several reliable sources estimate in excess of one-half million auto-radio receivers now in use whose "B" power is supplied from batteries. Unquestionably, the time is *ripe* for modernizing of these half-million sets with efficient "B" supply units. A thorough working knowledge of vibrator type units, their characteristics, method of installation and what makes them buzz is imperative.

Types of "B" Supply Units

Two styles of "B" supply units are prevalent, the tube type using an 84 tube for rectification and the other, a self-rectifying unit which uses an additional set of contacts in synchronism with the breaker contacts to rectify. All modern units are full-wave. Half-wave rectifiers are not worth mentioning. A tube type unit will be broken into to see what makes the wheels go round.

Of particular interest in the Multi-tap "B" power supply unit is the complete shielding of each major component part. Naturally the pack is shielded in its entirety by the container. The vibrator is of the plug-in type and a six-prong mounting holds the unit rigid and eliminates any possibility of coming loose no matter how rough the road. All parts are mounted directly on the chassis, which chassis is not fastened to the cabinet but being a snug fit all around and is held in by the cover which is held on with four sturdy self-tapping screws. These screws have a standard 6-32 thread so that should they become lost any 6-32 screw will do the trick. Should it be necessary, for any reason, to examine the unit it is merely a matter of taking out the four cover screws, removing the cover and lifting out the chassis. This does away with becoming a contortionist while servicing if the unit is mounted under the dash board or other especially convenient spots.

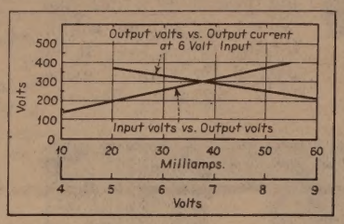


Fig. 2. Regulation curves when using the 250-volt tap of the unit.

The Circuit Arrangement

The complete wiring diagram is shown in Fig. 1. Special attention is called to condensers C-1 which are shunted directly across each half of the high secondary winding. Their purpose is to lower the peaks occurring in this circuit. Oil condensers with a working voltage of 3500 are required. All other condensers and resistors are of conventional design. A relay labeled REL is included in the pack controlling the "B" unit from the radio set. The relay coil is in series with the "A" supply to the set so that when the switch on the set is "turned on," current flows through this coil, closing the relay contacts and thereby turning on the pack. In this way there is no necessity for molesting the wiring in the set or going into the set at all when installing the power unit.

Since the variation in current drain differs but slightly for a wide range of sets (for a given plate voltage) the 135- and 180-volt taps are gotten by series resistors rather than a voltage divider, thus saving extra load on the contacts. Variations of plus or minus 15% in the total load current on the set will cause voltage variations of only plus or minus 10 volts on the 180-volt tap. Corresponding variations will occur on the 135-volt circuit. The 90-volt tap intended for screen voltage only, has a separate bleeder and consequently will be little effected by load variations. Fig. 2 shows regulation curves on the 250-volt tap.

Operation of Vibrator

With the exception of the vibrator portion the power circuit is identical to any normal a-c operated radio receiver. Turning on the switch on the radio set allows current to flow through the tube filaments. But this current must first go through the relay (REL) in the pack closing the relay contacts and turning on the "B" power unit. Current flows through the Coil L-4 in the vibrator unit, drawing the reed over, making contact with one arm. This action accomplishes two things—firstly, it allows current to flow in one-half of the primary setting up a high voltage in the secondary winding, and secondly, shorts out the coil allowing the reed to spring back through its own tension. In springing back it connects with the opposite contact arm sending current through the second half of the primary but in an opposite direction. Consequently a reverse current is set up in the high-voltage winding.

The reed has by this time lost its spring power and, since leaving the first contact, the coil is exerting magnetic effort, the reed is pulled back to the first contact to repeat the cycle. The voltage induced in the secondary, a form of a-c is rectified by the 84 and filtered in the usual manner.

The input has no positive or negative so that it makes no difference which side of the car battery is grounded—the output polarity is always correct.

All parts are firmly anchored to the chassis, nor should this feature be passed over lightly. The continuous vibration and jarring will tear loose anything which is not tied down to stay down.

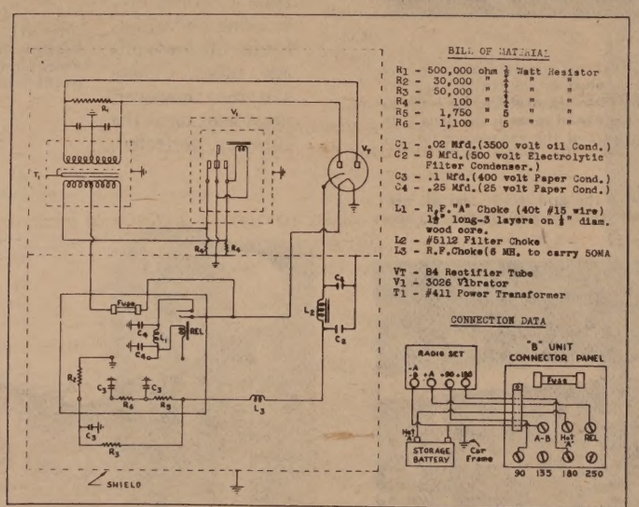
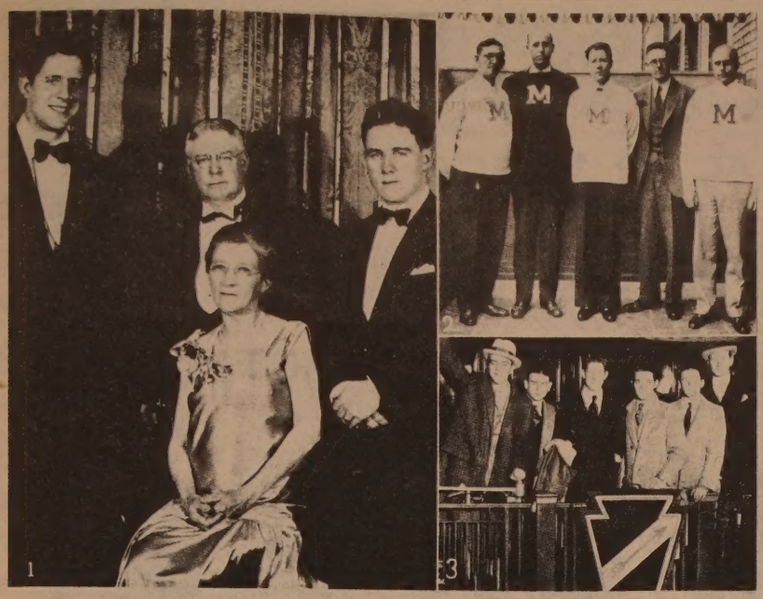
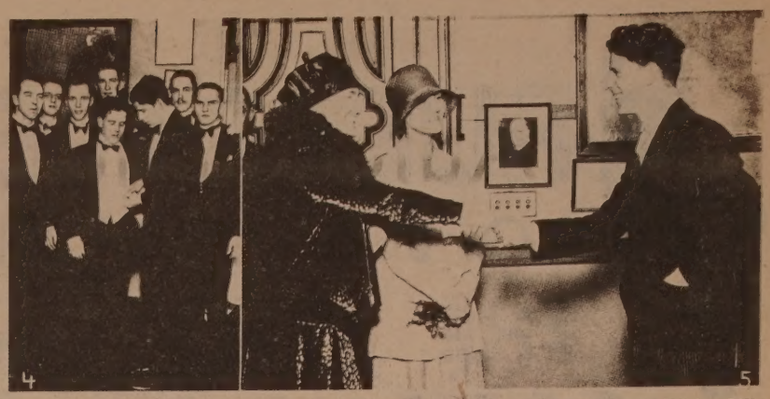

BILL OF MATERIAL
R1 - 500,000 ohm ½ Watt Resistor
R2 - 30,000 " 1 " "
R3 - 50,000 " 1 " "
R4 - 100 " 1 " "
R5 - 1,750 " 5 " "
R6 - 1,100 " 5 " "
C1 - .02 Mfd.(3500 volt oil Cond.)
C2 - 8 Mfd.(500 volt Electrolytic Filter Condenser.)
C3 - .1 Mfd.(400 volt Paper Cond.)
C4 - .25 Mfd.(25 volt Paper Cond.)
L1 - R.F."A" Choke (40t #15 wire) 1½" long-3 layers on ¾" diam. wood core.
L2 - #5112 Filter Choke
L3 - R.F.Choke(6 MH. to carry 50MA
VT - 84 Rectifier Tube
V1 - 3026 Vibrator
T1 - #411 Power Transformer
CONNECTION DATA
RADIO SET
"B" UNIT CONNECTOR PANEL
STORAGE BATTERY
Car Frame
A-B
Hot
REL
90 135 180 250
SHIELD

Fig. 1. Complete schematic diagram of the Auto "B" Supply unit.

*Chief Engineer, General Transformer Corp.

MOMENTS IN THE CAREER OF RADIO'S "ACE"





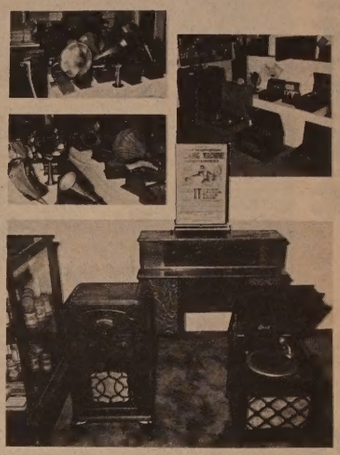
(1) The family group. With Mother and Dad (Mr. and Mrs. Charles A. Vallée) and brother Bill.
(2) The University of Maine awards the prized 'M' to Rudy for making 'The Stein Song' world famous.
(3) Rudy and some of his boys come to the platform to receive an ovation from thousands who welcomed them on their triumphant return from Hollywood.
(4) Rudy presents brother Bill with "S.A.E." emblem, as other fraternity brothers look on.
(5) Rudy meets and chats with The First Lady of the Land.

14. Rare photos from an NBC souvenir program booklet 1930.

FROM THE J. HERBERT ORR MUSEUM OF SOUND . . . .

Color Photographs of the MUSEUM OF SOUND . . . .

Photographs consisting of the world's most remarkable collection of phonograph's and radio's ever amassed by one individual. Owned by magnetic tape pioneer, J. Herbert Orr, this collection was considered the world's largest of its kind. Now available is promotional literature, color, black & white photographs of the J. Herbert Orr Museum of Sound.



What makes these photographs so important? The collection was sold November 1982 at auction. Never again will such a collection be seen. Also available in a limited number are auction brochures which shows and identifies many individual pieces in this remarkable collection.

Also available from the Museum . . . A.C. Dayton Radio Reproduction Posters. A.C. Dayton radio's were sold by the young Orr himself in 1925. This poster is a reproduction of his business sign which hung outside his shop in 1925.

Don't miss this historical opportunity to obtain a piece of history and memorabilia from the J. Herbert Orr Museum of Sound.

Color brochure with individual black & white photographs of the J. Herbert Orr Museum of Sound..... $10.00

Color brochure of the 1982 Auction ..... $ 5.00

A.C. Dayton Radio Reproduction Poster 39" X 25" $12.00

Entire 3 piece package..... $15.00

Write to: J. Herbert Orr Museum of Sound Memorabilia
P.O. Box 1030
Opelika, AL 36801

A-C DAYTON RADIO
Sold by
J. H. ORR, JR.
OPELIKA, ALA.
For the man who believes his own ears

PUETT ELECTRONICS

P.O. BOX 28572 DALLAS TX 75228

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THE 1983 ANTIQUE RADIO CATALOG NO. 21 $1.00 POSTPAID

THE ANTIQUE RADIO RESTORATION HANDBOOK
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RADIO NEWS Super Heterodyne Book
SILVER GHOSTS
RADIO APPARATUS
NEOTRON POWERTUBE "Standard for all sets"
THE CLASSIC RADIO COLLECTORS HANDBOOK
HOW TO ELECTRIFY YOUR RADIO SET
PHILCO PARTS
All About Aerials and Their Construction
Complete and Detailed Instructions of How to Build and Install Every Known Aerial for the Radio Amateur
With 12 Blue Prints.
PUBLISHED BY CONSOLIDATED RADIO CALL BOOK CO.

OLD TIME RADIO SHOWS

Build the Set That Holds 4 World's Records

The receiver that brought in stations 6,000 to 8,000 miles distant with loud speaker volume night after night.

Holds World's Records For

(1) Longest distance ever received on a loop aerial—8,375 miles
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(3) Brought in 6 different stations in 2½ hours—all over 6,000 miles

Full sized blue prints with complete instructions showing how to make exact duplicate of this marvelous receiver.

PRICE $5

Story of development and proofs of records sent on receipt of stamped and addressed envelope.

Scott Radio Laboratories
35 S. Dearborn St., Chicago
Dealers and Jobbers Write

HHELP!!!!!!!

IN THE EARLY YEARS, E.H. SCOTT PLACED THIS AD IN MANY DIFFERENT PERIODICALS.

WE NEED A COPY OF THE BROCHURE WHICH SCOTT SENT TO THE PEOPLE WHO REPLIED TO THIS AD FOR THE NEW SCOTT BOOK!!!

THE FORMER CHIEF ENGINEER OF THE E.H. SCOTT RADIO LABORATORIES IS PREPARING A BOOK ON THE HISTORY OF THE COMPANY. THE BOOK IS EXPECTED TO COME OFF THE PRESS IN THE FIRST QUARTER OF 1984. WATCH FOR THE AD FOR THIS BOOK, BUT MEANWHILE, CAN YOU HELP US WITH THE INFORMATION WE SEEK?

WE WILL BE GLAD TO TRADE MERCHANDISE OF EQUAL VALUE FOR A PHOTOCOPY OF THE SALES BROCHURE AND/OR ANY LETTER OR OTHER CORRESPONDENCE RELATED TO THIS AD.

SPECIAL OFFER

IF YOU WISH TO RENEW YOUR SUBSCRIPTION TO ANTIQUE RADIO TOPICS AND THE CLASSIC RADIO NEWSLETTER FOR 1984, WE OFFER THIS SEVEN SERVICES SUBSCRIPTION AT $12.00 IF WE RECEIVE YOUR ORDER BEFORE 30 NOVEMBER 1983.

SUPER SPECIAL - YOU MAY ORDER OUR BOOK, SILVER GHOSTS (REGULAR $10.95) AT $4.95 POSTPAID BEFORE 30 NOVEMBER 1983!!!!!!!

OLDE TYME RADIO CO.

NEED HARD TO FIND OLDE TYME RADIO PARTS SUCH AS:

*VINTAGE TUBES	*HEADPHONES
*AK STYLE BATTERY CABLE	*HEADPHONE & SPEAKER CORDS
*OLDE TYME HOOKUP WIRE	*ANT, RF, OSC, IF COILS
*BROWN SILK TYPE POWER CORD	*SPEAKER GRILL CLOTH
*AUDIO TRANSFORMERS	*PILOT LAMPS
*POWER TRANSFORMERS	*XTAL SET PARTS

AND MUCH, MUCH MORE. ALSO, AS A CONVENIENCE TO YOU, WE CAN EVEN PROVIDE COPIES OF THOSE EVER POPULAR BOOKS "VINTAGE RADIO & FLICK OF THE SWITCH" IN SOFT COVERS. SCHEMATICS OF MANY VINTAGE RADIOS AND TV SETS ARE ALSO AVAILABLE. FOR FREE FLYER SEND SASE TO OLDE TYME RADIO COMPANY, 2445 LYTTONSVILLE ROAD, SILVER SPRING, MD.

WISH TO REACH US BY PHONE? THE NUMBER IS 301-585-8775. PLEASE CALL BETWEEN 7:00 AND 11:30 PM LOCAL TIME ANY DAY OF THE WEEK.

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THE ALL NEW EXPANDED ARS PRODUCT LINE

BIGGER and BETTER than ever!
Now that we're settled in our new quarters, we have:

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- Wider Selection

Now includes consumer electronics !!

And the CATALOG is FREE for the asking!

YES, I would like to receive the all new ARS catalog. (Sorry, limit one per request.) HS 4

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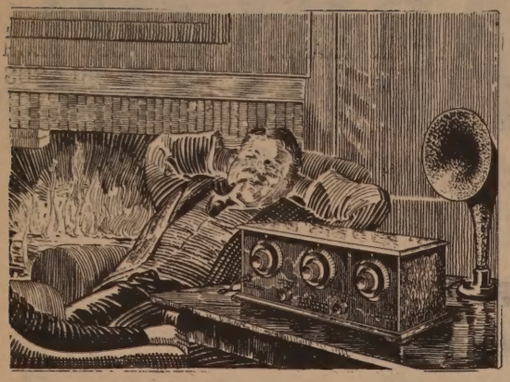
City_____ State____ Zip_____

Send to: ARS Electronics, 3030 Pheasant Creek Drive, Northbrook, IL 60062

ARS electronics



Mailbox

Dear Jim,

I read with interest the article on wind generators in the September issue. It recalled the days of the 1930's, when there was no electricity on the farms.

In those days, we had a battery radio and used it only at night as the battery would run down in a short time. We this happened we had to take the battery into town, 12 miles away. To charge the battery cost ten cents, which we always didn't have. It was depression days remember.

To save money I used a generator from an old 1928 Buick. I carved a 5 foot propeller from a piece of cedar, mounted it on shaft with a pulley on it for a belt. Mounted the generator below the pulley and placed the whole unit on top of the machine shed.

Presto, we had current to charge our radio battery. crude, but efficient and it saved us 10 cents.

Goerge Friedrich
7162 Jacqueline
Lake Lane
Custer, Wi 54423

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SALE

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FOR SALE- CATHEDRAL, BATTERY and A.C. radios. Send SASE with two stamps. J. Albert Warren, Box 279, Waverly, PA 18471
****
SELLING RADIO COLLECTION. Send S.A.S.E. for list of radio magazines and books. D. Harrison, 714 N. Hague Avenue, Columbus, OH 43204. Phone (614) 279-4619. NO - collect calls please.
****
SCOTT 33 TUBE AM FM PHILHARMONIC , mint condition, deco cabinet, $1250.00 -- David Pierson, 635 East Buchtel, Akron, OH 44304 (216) 376-3107.
****
USED TUBES, NEW AND USED RADIO AND TV PARTS, SEND S.A.S.E. FOR LISTS. ELMER NELSON, 11 S. CHURCH STREET, PRINCETON, IL 61356.
****
DX CRYSTAL, ONE TUBE sets, kits, plans, handbooks, coils, supplies. Obsolete tube quotations. Catalog $1.00; none free. Laboratories, 1477-H, Garden Grove, CA 92642.
****
FOR SALE - ARM CHAIR RADIO, NEW USED TUBES 504 AC AND BATTERY RADIOS ATWATER KENT BATTERY MODEL 33 CABINET, RUSS SCHOEN, R#1, CLINTONVILLE, WI 54929
****
TUBES FOR EARLY ELECTRIC RADIOS. SASE FOR FREE PRICE LIST. SAM FAUST, CHANGEWATER, NJ 07831
****
LARGE SPRING MOUNTED MICROPHONE, DeForest crystal det. and other early radio accessory items. Many new in original boxes. Sold as a lot. SASE. Dexter, 167 Linden Tree, Wilton, CT 06897.
****
"MISC. PARTS FOR SALE: MARCONI, DeForest, Federal, Radiola, John Firth (Firco), Fada, Atwater Kent and much more. SASE, Joe Horvath, 522 Third Street, San Rafael, CA 94901"
****
CATHEDRALS, BATTERY SETS, tubes, manuals, parts, etc. Send SASE to Bob Husted, 270 N.W. 3rd Court, Boca Raton, FL 33432
****
OLD RADIO AND T.V. literature. L.S.A.S.E. for list. HERMAN FOTHE, 10 JACKSON STREET, SLOATSBURG, NY 10974
****
FOR SALE TO BEST OFFER, RIDER MANUALS Vol. 4-14 with index, 530 Hickok tube tester, Hickok AM-FM signal gen. 340 radio tubes (new), caps. resistors, xformers, vibs, pots, etc. SASE for complete inventory. C. E. Olmstead, 428 No. 13th, Breckenridge, MN 56520
****
FOR SALE: 01A's $4.00 ea. plus shipping, hundreds of tubes $1.00 ea. S.A.S.E. for list. Bruce Harbeck, 13408 Westwood Lane, Omaha, NE 68144
****
HOMEBREWERS- 1/8" GLOSSY BLACK BAKELITE PANELS ANY SIZE. TWO 20 CENT STAMPS FOR SAMPLE. BOB, W6ME, 4178 CHASIN STREET, OCEANSIDE, CA 92056. PS NEED TUNING CONDENSERS FOR NATIONAL SW-5.
****

WANTED

****
OLDIE RADIO TUBES, PARTS, JUNKER SETS, AND RESTORABLE SPEAKERS. PHILCO BABY GRAND CATHEDRAL OR CHASSIS, CIRCA 1930, FRANKLIN HAAS, 207 WEST 30TH, HUTCHINSON, KANSAS, 67501

LOOP ANTENNAS, Magnavox M-4 base and driver. Richard Jehlik, 8320 N. 28th Street, Omaha Nebraska, 68112, (402) 457-4604 after 7 p.m.

WANTED: 21 INCH OAK OR MAHOGANY MUSIC MASTER BELL. CONDITION NOT IMPORTANT. CHARLIE STEWART, 900 GRANDVIEW AVENUE, RENO, NV 89503

WANTED: ATWATER KENT CONDENSERS variable, detector and amplifier tube panel and filament control and switch panel. William L. Compton, 11 Harbor Woods Drive, Clearwater, FL 33519.

PHOTOCOPIES OF ANY LITERATURE ON THE PHILHARMONIC RADIO CORPORATION FROM 1936 TO 1943 AND SERVICE DATA FOR FISHER RADIO RECEIVERS FROM 1946 TO 1949. ALSO, TECHNICAL DATA FOR FISHER MODELS R2 AND TV5. J.W.F. PUETT, P.O. BOX 28572, DALLAS, TX 75228

WANTED: EARLY BATTERY RADIO PARTS, ALSO JUNKER PANELS/ BASEBOARDS FOR STRIPPING. BROKEN PANELS OK, BUT DO NOT WANT ANY CABINETS. SEND LIST AND PRICES TO: BOB, W6ME, 4178 CHASIN STREET, OCEANSIDE, CA 92056

WANTED: FOR A SPECIFICALLY

CHELSEA SUPER 6, 1926, 5 tube TRF battery radio, schematic and one original black medium gloss bakelite control knob, 1&1/4D.x3/8H. fluted, a 1/2"L slightly raised arrow on a low curved top. D'Arcy Brownrigg, Chelsea, Quebec, J0X 1N0, Canada.

HALLICRAFTERS SX-28, S-20R, KNIGHT "OCEANHOPPER". SEND PRICE AND DESCRIPTION WITH SASE. JOE WATSON, 3300 ARROWHEAD CIRCLE, ROUND ROCK, TX 78664

WANTED: ONE LATE 1920's style 0-2000 and 0-12 ohms 2 watt wire wound potentiometer. Shaft 1/4" x 1". All makes of KINO lamps and scanning discs. Would welcome vintage TV collectors interests in any construction projects. D'Arcy Brownrigg, Chelsea, Quebec, J0X 1N0, Canada.

WANTED: SPARK EQUIPMENT- HELIX, OSCL. XFRMR, XMT CONDENSER (MOULDED, LEYDON), KEY, HOT WIRE AMMETER, ROTARY SET, MURDOCK, THORDARSON CATALOGS, INFO. ELECTRICAL EXPERIMENTERS MAGS, ETC. PRIOR TO 1920. R. GROSHONG, 6604 KENT DR. NE, CEDAR RAPIDS, IA 52402.

PENNSYLVANIA WIRELESS RADIOS, made in New Castle, Pa. Any parts, nameplates or literature. I have excellent trade items or cash. Jerry Finamore, 501 Miller Avenue, New Castle PA 16101. Phone (412) 656-0338.

HALLICRAFTERS --- SERIOUS COLLECTOR needs Hallicrafter and other Ham equipment manufactured before 1940 for restoration and eventual museum exhibit. Need Hallicrafters, National, Hammarlund, Patterson, RCA, RME, Grebe, etc. Condition not important. Also need QST magazines Volumes I and II and old tubes. All letters answered. Write Dave Medley, 6621 Duffield Drive, Dallas, texas 75248, WA5YA.

WANTED: WESTERN ELECTRIC, CUNNINGHAM TUBES, AMPS, SPEAKERS, McINTOSH, MARANTZ AMPLIFIERS. (713) 728-4343. CORB, 11122 ATWELL, HOUSTON, TX 77096.

HALLICRAFTERS SPEAKER PM-23 USED WITH SX-28A. COXE, 1360-G NO. MANZANITA, ORANGE, CA, 92667.

RADIOLAS VII, VIIB, IX, GRAND, REGENOFLEX CABINET. SASE FOR LIST. RAYMOND THOMPSON, 7422 CHERRY TREE DRIVE, FULTON, MARYLAND 20759

PORTABLES FROM early 1920's, DeForest items and early AC sets using Kellogg tubes. Rosenthal, 507 S. Maryland Avenue, Wilmington, DE 19804

RADIO TUBE ECH81 OR 6AJ8. WILL BUY OR TRADE. COULD USE TECH. SPECS. OF 6AJ8. GEORGE BLASUS, P. O. BOX 223, 4950 SHERMAN DRIVE, BEMIDJI, MN 56601

CABINET FOR ATWATER KENT CATHEDRAL, MODEL 90, CASH OR TRADE. FOTHE, 10 JACKSON STREET, SLOATSBURG, NY 10974

RADIOLA IV CABINET, base for Thorola Junior. Richard B. Jehlik, 8320 N. 28th Avenue, Omaha, Neb. 68112 (402) 457-4604 after 7 p.m.

WANTED: WESTERN ELECTRIC audio products, Marantz and McIntosh tube audio equipment, surplus tubes and anything related. Contact Charles Dripps, 4331 Maxson Road, El Monte, CA 91732 (213) 444-7079

DETROLA PEEWEE MODEL 219 c. 1939 and MAJESTIC Model 5AK711 c. 1947. both are small AC/DC plastic sets. J.W.F. Puett, P.O. Box 28572, Dallas, TX 75228

WANTED: 1 TUBE SETS, CRYSTAL SETS, GREBE CR EQUIPMENT. RAY GARNER, ROUTE 1, BOX 320, BIG SANDY, TN 38221.

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THE HORN SPEAKER

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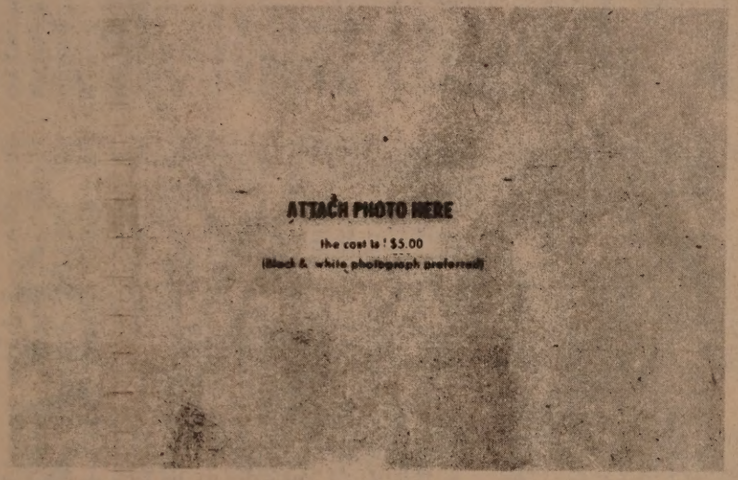

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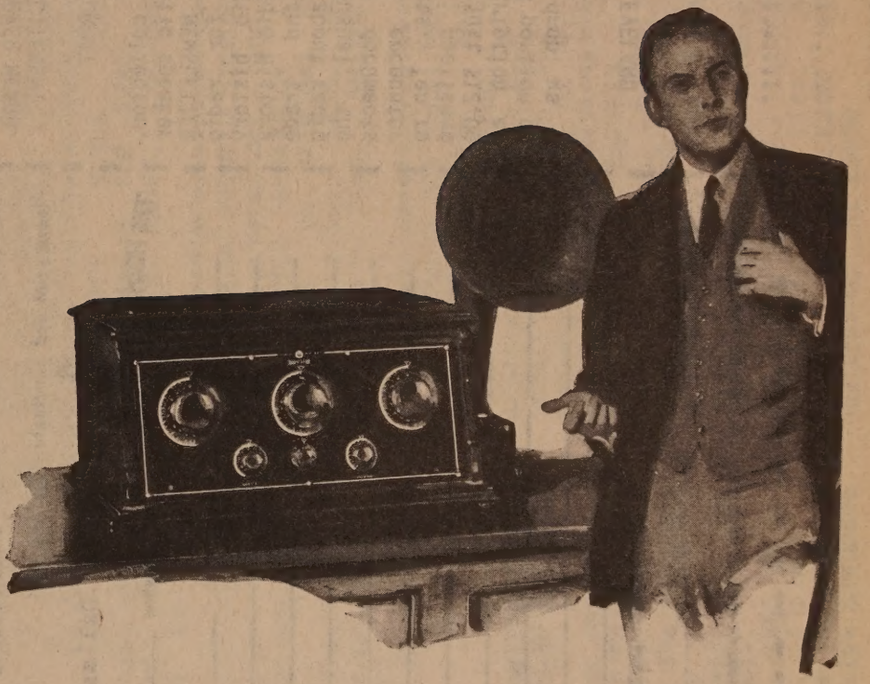
NOVEMBER

THE HORN SPEAKER

1983



FADA Neutroceiver No. 175-A
Mahogany cabinet. Inclined panel and roomy battery shelf. 5 tubes.

ART B CORBUS
5704 11TH AVE NW
SEATTLE WA -98107
5584 *73

FEBRUARY, 1925